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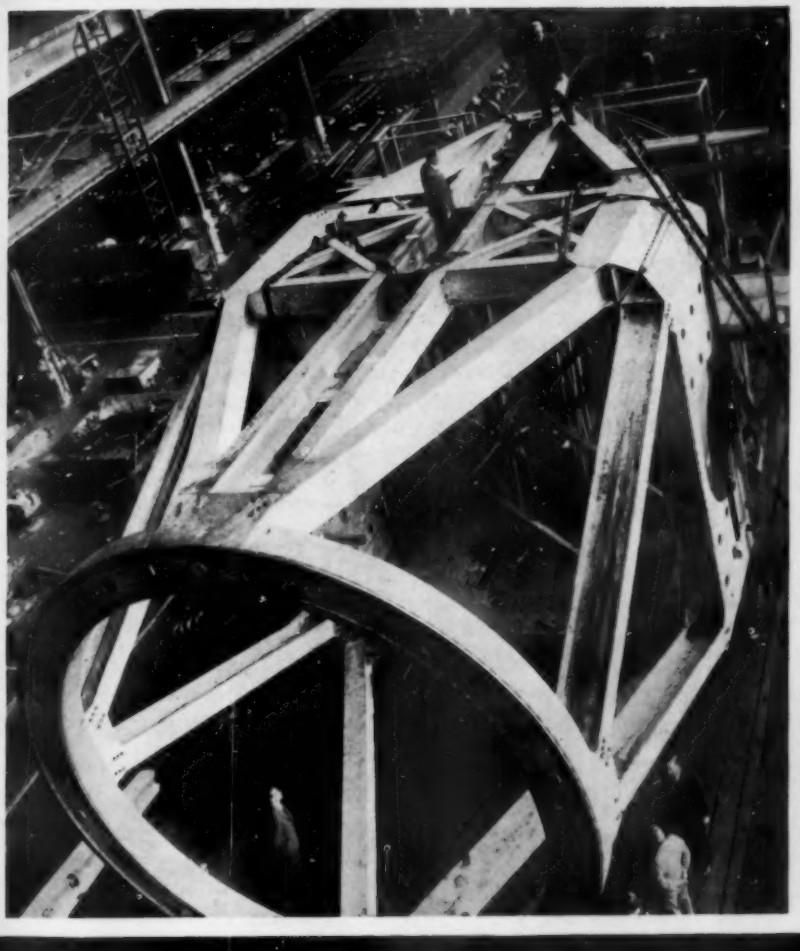
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



May 8, 1937

Ready

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The Weekly Summary of Current Science

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Edited by WATSON DAVIS

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DO YOU KNOW?

Dry ice makes an effective rat killer.

There were lions in Alaska, in an earlier geologic time.

Depth of snow is no guide to the amount of water the snow contains.

A farmer plowing with a two-horse walking plow has to walk about seven and a half miles to plow an acre.

Native swords and knives inflicted the worst wounds dealt by Ethiopians in battle, an Italian medical officer has reported.

Although tularemia is often called rabbit fever, the infection can be caught by man from over 20 kinds of wild animals and insects.

Attempts to raise silkworms in New York City are being made by a native of Iraq, who was an experienced silkworm breeder in his country.

One of the largest gorillas on record is a new exhibit in a tropical forest scene at the Academy of Natural Sciences in Philadelphia—height six feet, barrel chest five and three-quarters feet around, neck almost 28 inches.

Air-conditioning was tried in America on a railway passenger car, in 1884.

A church made of curved steel plates electrically welded has been built in Illinois.

Although some African art is worked out in bronze or other metals, the prevailing material is wood.

A bill for spending a million dollars a year fighting cancer has been sponsored by 94 United States Senators.

By a new and sensitive test, odor in water can be detected even if it is too faint for users of the water to notice.

A light coating of red copper oxide dust protects flower and vegetable seed from decay, a New York State Experiment Station has found.

A wild sugar cane resistant to cold has been brought from Turkestan, to see whether it can be crossed with varieties that are commercially valuable.

Hawaii, land of the pineapple and sugar cane, is studying opportunities for other commercial crops, notably tomatoes, asparagus, taro, and passion fruit.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.

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PUBLIC HEALTH

Is diphtheria conquered? p. 296.

PHYSICS

New Form of Matter Found In Cosmic Ray Bombardments

Unnamed and Unlike Other Recently Found Particles, It Fails To Fit Theories; Penetrates Platinum Brick

By DR R. M. LANGER

A NEW form of matter has been discovered. It has as yet no name. Unlike other recently discovered particles there is no empty niche in the present scheme of things to which the newcomer can be assigned.

The discoverers, Dr. Seth Neddermeyer and Dr. Carl D. Anderson of the California Institute of Technology, have just a few important properties to announce although they have concentrated on proving the existence and learning the nature of the new substance for over two years.

During that time the experiments seemed always to show the new particles, but because of the startling character of the particles the experimenters heretofore hesitated to emphasize the implications. It was the longest and most difficult problem undertaken with the famous apparatus built by Dr. Anderson.

With this apparatus, he discovered the positive electron in 1932, for which he received a Nobel Prize last year. It was necessary first to examine the behavior of electrons. Then protons had to be eliminated as a possible explanation of the apparent paradoxes.

Now they offer the latest striking evidence that the new particle is different from everything now accepted.

It is charged and carries about the same amount of electricity as is found on an electron or proton. Both positives and negatives are found. The particle is many times more massive than an electron and many times less massive than a proton. Its life here on earth is presumably very short for it is not found except in cosmic rays which have been bombarding the earth since the beginning of time. These properties are all inferred from a study of cosmic ray tracks in an expansion chamber.

The most recent conclusions were obtained from tracks which were seen to penetrate a platinum brick. The platinum, over a pound in weight, replaced the lead brick in the chamber in which five years ago Dr. Anderson discovered the positive electron. Platinum is twenty-one times as dense as water and almost twice as dense as lead. The platinum brick was lent to the scientist by the Baker Company.

The experiments consisted of measuring the curvature of the cosmic ray tracks before and after penetrating the plate.

Ordinary electrons produce many protons and secondary electrons. The new particles penetrate without much energy loss and almost never produce protons. All they do is to push aside the other particles and electrons in their way.

Other workers have recently become convinced that particles hitherto unknown occur among the cosmic rays. Drs. Neddermeyer and Anderson feel that some exciting and important results are due to come out in the near future. These are certain to clarify our understanding of ordinary electrons and protons as well as to extend our knowledge of cosmic radiation and of the fundamental forms of matter.

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MEASURING WIND

This unusual picture shows how scientists measure the velocity of upper air winds at night. It is the view of the special "fish eye" camera which sees the entire sky from horizon to horizon. A small balloon sent aloft with magnesium flares timed to ignite every few seconds produces the flashes appearing as spots in the top left center. The dimmest flash occurred at an altitude of 13,000 feet and a distance of seven miles. The bright spot centered above the big circle is a point of light which indicates true south. The light of the moon shows at the right, and around the edge of the circle are lights of neighboring cities.

METEOROLOGY

Camera, Balloon and Flare Record Night Wind Velocities

A PHOTOGRAPHIC method of charting the directions and velocities of night winds high above the earth, a development expected to be of considerable value in weather forecasting and aircraft operation, has been developed in the Massachusetts Institute of Technology meteorological laboratory.

Cardinal feature of the method lies in its use of a "whole sky camera," one employing a wide-angle or 180-degree lens, and a sounding balloon equipped with flares so attached to an ordinary piece of blasting fuse that they flash at set time intervals.

Developed by Athelstan F. Spilhaus of the Woods Hole Oceanographic Institute, now conducting research at Technology, the new method is expected to permit studies of complicated wind structures not only in greater detail than has heretofore been possible but more accurately and more easily as well.

In operation the camera is set at a chosen observation point with its lens pointing directly overhead. As the balloon ascends the flashes of the magnesium flares, set off at time intervals as small as five seconds if desired, are recorded on the photographic plate. The picture taken by the wide-angle lens is circular, the circumference showing the horizon on all sides. Thus the brilliant magnesium flashes are recorded regardless of what direction the balloon takes.

By measuring the resulting angles of

elevation and direction between the camera station and the recorded flashes and correlating these data with the rate of the balloon's ascent, a complete and accurate record of wind velocity and direction is easily obtained.

Previous method of charting winds of the upper air has been to release a balloon and to follow its course with a theodolite with which the investigator reads the angles of elevation and direction every half-minute or minute.

At night, research workers have hung a paper lantern containing a lighted candle from the balloon and followed this light. The candle, of course, is very dim and its light is lost rather quickly. Some observers have been known to plot the course of stars, thinking they were trailing the lantern.

The Spilhaus method, however, practically eliminates this "human equation" and even the most inexperienced observers can easily make rapid and accurate readings photographically. The set-up is all but automatic—all the observer has to do is to open the camera shutter and release the balloon after he has lighted its fuse.

In preliminary tests the flashes have been recorded at distances as great as seven miles and at heights in excess of 13,000 feet. Meteorologists expect, however, that both this distance and this altitude can be greatly exceeded.

Formal announcement of the new method was made by its inventor at the meeting of the American Meteorological Society at the United States Weather Bureau in Washington, D. C.

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AVIATION

New Blind Landing Beacon Has Antenna Underground

Pit Antenna Is Found to Give Steeper and More Satisfactory Approach Path for Landing Airplanes

A NEW radio landing beam that emerges from an underground pit and holds great promise for making blind landings of airplanes practical and safe in foggy weather has been described by two National Bureau of Standards scientists, H. Diamond and F. W. Dunmore.

The transmitting antenna is placed in a special subterranean compartment under the center of the landing field instead of being erected dangerously in the air at the edge of the field. The Bureau of Standards scientists had their preliminary work done and ready to report two years ago but the interest of another government bureau delayed the scientific announcement. The recent scientific paper before the joint meeting of the International Scientific Radio Union and the Institute of Radio Engineers was the first public report.

About six years ago the same group of government scientists developed a radio beacon system for aircraft landing fields which was so effective that after demonstrations in this country it was adopted and put into extensive use in Europe, Japan and Russia. It has not been installed as regular equipment on American landing fields, however.

The new pit antenna improves this radio landing beacon. In the landing system, the airplane glides down a path that is marked by equal strength of radio signal, indicated on a convenient dial on the plane's instrument panel. The way that radio waves travel from the transmitting antenna makes this system possible. One kind of wave goes directly from the antenna to the plane, while another goes from the transmitting antenna to the ground and then is reflected to the plane.

The interference of these two waves and decreasing distance combine to allow the plane pilot to steer his craft along a radio path to a happy landing even if he can not see the landing field.

When the transmitting antenna is in the air at the field's edge the path of the landing glide was a little too flat. Now the pit antenna gives a steeper and more satisfactory approach path. A further advantage of the underground system is that it can be built on a turntable and swung around to conform to wind direction, thus allowing landings from any direction to be made with the aid of only one antenna. Previously several antennae at the edges of the field were necessary.

One possibility is that the whole radio equipment, transmitter as well as antenna, can be put underground at the landing field's center.

Two Berlin scientists, Ernst Kramar and C. Lorenz, discussed the principles of blind landing radio system applied in Germany based in part on the earlier American system.

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GENERAL SCIENCE

15 Scientists Honored By Election to the Academy

FIFTEEN new members of the National Academy of Sciences were elected at the Academy's meeting. Membership in this organization is one of the most distinguished honors within reach of American scientists.

Ten of the new members represent the "natural" sciences—biology, geology, medicine, psychology, etc.: Dr. C. B. Bridges, California Institute of Technology; Dr. E. W. Goodpasture, Vanderbilt University; Dr. C. G. Hartman, Carnegie Institution of Washington; Dr. D. F. Hewett, U. S. Geological Survey; Dr. Leo Loeb, Washington University (St. Louis); Dr. D. A. MacInnes, Rockefeller Institute for Medical Research; Dr. G. R. Minot, Boston City Hospital; Dr. F. B. Sumner, Scripps Institution of Oceanography; Dr. Charles Thom, U. S. Department of Agriculture, and Dr. E. C. Tolman, University of California.

Five represent the "exact" sciences—physics, astronomy, mathematics, etc.: Dr. Oliver Ellsworth Buckley, Bell Telephone Laboratories; Dr. Arthur Jeffery Dempster, University of Chicago; Dr. John von Neumann, Institute for Advanced Study; Dr. Seth B. Nicholson, Mt. Wilson Observatory; Dr. Otto Struve, Yerkes Observatory.

Prof. August Krogh of the University of Copenhagen, Denmark, noted for his research in animal physiology, was elected as a foreign associate of the Academy.

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In 1918, army tanks usually ran less than 100 miles between major overhauling of the mechanism; now tanks generally run several thousand miles without mechanical failure.

A survey of existing roads to find out what the country has, and needs, in its highway system is to be made by over 40 states working with the Federal Government.

Sidelights of the Spring Academy Meeting

DISCUSSION

One of the most interesting features of a meeting such as the spring gathering of the National Academy of Science is the discussion that goes on in the lobby. At the left above, Dr. H. C. Urey, Columbia University Nobel Prize winner, (right) listens with rapt attention to what is being said by Dr. Ross Gunn, of the Naval Research Laboratory. Dr. R. W. Wood, of Johns Hopkins University, left center, is registering and receiving his program.

INFORMAL

One may guess that the topic of conversation is cosmic rays as Dr. M. S. Vallarta, of the Massachusetts Institute of Technology, greets Dr. R. A. Millikan, of the California Institute of Technology (right) in the scene at the upper right. Dr. Oscar Schotte, Amherst College, explains (center right) details of his paper on a tadpole with eyes, ears and mouth growing in its tail. The gay lady with the bouquet is Mrs. A. H. Compton enjoying the famous wit of Dr. C. G. Abbot, secretary, Smithsonian Institution.

GEOPHYSICS

How Loud Is an Earthquake? Comparison Scale Proposed

Geophysicists Also Discuss New Device for Measuring Blueness of Sky; Tornado Frequency is Mapped

HOW loud is an earthquake?

This question was raised before the American Geophysical Union by Dr. H. Landsberg, seismologist at Pennsylvania State College.

The noises that accompany earthquakes, often terrifyingly loud and grinding, have never been adequately accounted for, said Dr. Landsberg. They do not always appear to originate at the point of maximum disturbance, the earthquake's epicenter. It is also difficult to figure the amount of earthquake energy diverted into the production of noise; calculations made by Dr. Landsberg indicate that only one ten-thousandth of the energy of the shock waves can pass into the air as sound waves.

It would be possible to record the energy of the earthquake noises in terms of decibels, the seismologist stated. However, the necessary sound-recording instruments are unlikely to be around when an earthquake happens. For this reason, Dr. Landsberg proposed a five-grade comparison scale for auditory comparison:

1. Whisper, or rustling of paper.
2. Conversation, quiet car moving at low speed, slight knocking.
3. Distant thunder, distant artillery fire, distant drums, church bells, rumbling inside slow-moving train.
4. Heavy thunder, noise in slow subway, train in tunnel, avalanche, artillery fire, waterfall.
5. Nearby explosion, quarry blast, noise in airplane, collapse of building.

Measure Sky's Blueness

How blue is the sky?

That is not a mere rhetorical question put by a poet for the purpose of dragging his lady's eyes into the discussion. The exact color of the sky is a matter of considerable scientific, commercial and even military importance, for it is a measure of air turbidity, dust content, haziness, etc., affecting visibility at a distance, intensity and color composition of sunlight, and a number of other intangible but important matters.

A new device for measuring the sky's blueness was described by Drs. H. Landsberg and H. Jobbins of Pennsylvania State College. It is considered an advance over the series of standard color cards hitherto employed, being more rapid and direct in use, and having no abrupt jumps from one degree of blueness to another.

The device consists of a wedge of clear blue glass of a standard hue, mounted so that sunlight is reflected through it from a mirror. Half of the opening of the frame in which it is mounted is open, so that the observer can look at the sky, and then slide the wedge along until the color matches. The deeper the blue, the thicker the part of the wedge needed to make a correct match.

In trial observations, Drs. Landsberg and Jobbins have found that the bluest part of the sky offers the best visibility; a pale sky means poor seeing. The part of the sky 90 degrees of arc away from the sun and on the opposite side of the sky is usually the deepest blue.

Where Tornadoes Rage

Has your county got the tornado habit?

A map shown before the meeting of the geophysicists by Drs. Charles W. Brown and Wyndham O. J. Roberts, of Brown University, could tell you.

Drs. Brown and Roberts have marked on every county on the map the number of its recorded tornadoes during a 50-year period, and have tried to trace "isotorns," or lines of equal tornado frequency, as isotherms indicate equal temperatures and isobars equal atmospheric pressures.

Isotorn tracing was not an easy task, they found, for some counties turned out to be tornadoless "islands" in the midst of areas of rather high tornado frequency.

Their map "debunks" one traditional notion: that all of Kansas and other western states are "cyclone country." The higher, drier parts of the Plains have relatively few tornadoes; only when one gets into regions of higher rainfall do the twisters begin to make a formidable showing.

Other regions of low tornado frequency are the northern border of the central region, the seaward margin of the coastal plain from Texas to New Jersey, and the Appalachians from hilly Georgia to New England.

Safer Aviation

Greater safety for planes, their pilots and their passengers, is sought in a program of research for high-flying little balloons proposed by Prof. Charles F. Brooks of Harvard University.

These small unmanned balloons are just passing out of early experimental stages at present. Carrying feather-weight, ultra-shortwave radio sending sets, they will soon be ascending in scores and hundreds daily from weather observatories everywhere. They can gather and report weather data at altitudes of 20,000 feet or more, beyond the reach of human fliers except at unjustifiably great expense.

Prof. Brooks laid out a seven-point research program, which he recommended for the adoption of meteorologists interested in upper air phenomena, and which will have its applications in ground-level weather studies, too.

Among his points are: study of extent, heights, shapes of fogs and cloud masses, and their chances of clearing up; types and causes of "rough air;" fronts of contact between warm and cold air masses, with especial attention to lightning, and to winds that "go straight up"; ice conditions, their extent and height; high-altitude observations, with a view to better forecasts; hurricanes and typhoons; variations in ultra-shortwave radio transmission in relation to atmospheric stratification and fronts.

Prof. Brooks hailed as "a notable step" the action of the U. S. Weather Bureau in asking for bids on daily radio-meteorograph ascents at some pioneer station, to begin Sept. 1.

Ways of the Sea

As little unmanned aircraft are to be used to search the trackless ways of the air, so other little unmanned craft are being launched to follow the equally mysterious ways of the sea. Dr. H. U. Sverdrup, director of the Scripps Institution of Oceanography, reported a cooperative research program participated in by his institution and the California Fish and Game Commission, which includes the releasing of 6,000 drift bottles at sea. Each bottle contains a paper

stating where it was dropped overboard and requesting its return.

Quantitative measurement of the dim light that fish and seaweed live by is being undertaken with a new instrumental set-up devised by Dr. R. T. Young of Worcester Polytechnic Institute, Dr. Sverdrup continued. This consists of a watertight casing containing a photoelectric cell, which can be lowered into the water. At the same time a twin photoelectric cell in the boat registers the surface light. The differences between the two readings, after calibration, shows how much light the water absorbs.

Other lines of research being followed at the Scripps Institution include studies of ocean temperatures, currents, and salinity, identification and counting of the little known bacteria of the sea, collection and statistical studies of other marine microorganisms, and "applied" scientific work on such diverse problems as the fouling of ships' bottoms and the behavior of fishes.

Seismographs Aid Engineers

As you speed along the smooth, paved highway, you are all unconsciously indebted to benefactors who are equally unconscious of their contribution to your comfort.

Modern highway building owes much to seismologists, men devoted to the "pure" science of earthquake study, who know nothing of highway engineering.

The connection was pointed out at the meeting of the American Geophysical Union, by E. R. Shepard, research engineer of the Bureau of Public Roads, U. S. Department of Agriculture. Highway engineers are now making use of seismographs, invented by earthquake scientists, as oil geologists did before them, Mr. Shepard stated.

Highway engineers are using these instruments in the same way and for much the same purpose as the oil-seekers. That is, they start small artificial earthquakes with charges of dynamite, and then study the record of the waves as they come back to the seismographs, to see how far down it is to bedrock.

The thickness and nature of the loose soil above bedrock has much to do with the kind of foundations that have to be laid for the road. Knowledge of this kind makes for safer and longer-lived pavements, and frequently results in economies in construction.

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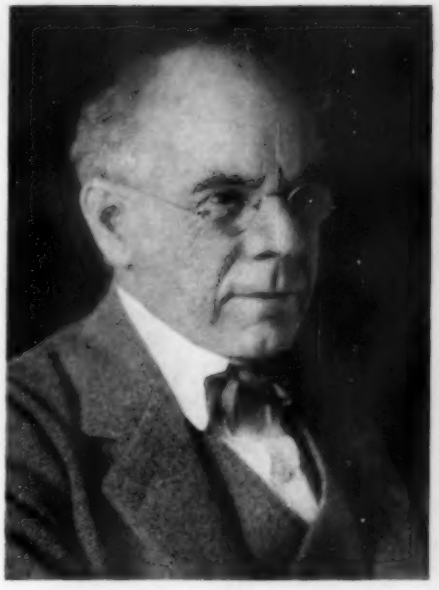
Goldfish are mentioned in Chinese writings 12 centuries old.

Science Service Presidents



DR. J. McKEEN CATTELL

DR. EDWIN G. CONKLIN

DR. Edwin G. Conklin, noted Princeton biologist, was elected president of Science Service, the institution for the popularization of science, at its annual meeting just held.

Dr. J. McKeen Cattell, pioneer psychologist and also editor of *Science* and other journals, had made known his desire not to be reelected after nine years in the presidency. Dr. Cattell continues as a member of the board of trustees on which he has served continuously since Science Service was founded in 1921. The trustees and staff of Science Service joined in honoring Dr. Cattell at a dinner.

Dean Carl W. Ackerman of the Columbia University Graduate School of Journalism was added to the board of trustees to fill the vacancy caused by the death during the year of Marlen E. Pew, veteran newspaperman.

Dr. W. H. Howell, noted physiologist of Johns Hopkins University, was reelected vice-president and chairman of the executive committee, while Harry L. Smithton of Scripps-Howard Newspapers was reelected treasurer.

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AGRICULTURE

Pink-Hearted Cabbage From Imported Stock

A PINK-HEARTED type of cabbage has been grown from stock imported from Turkestan, at the experiment station of the U. S. Department of Agriculture, at Beltsville, Md., Dr. Roy Magruder reports. (*Science*, April 30.)

The heads are green outside. As the leaves are stripped off, the inner ones are first the usual cabbage-white or cream color. Then, varying from a half-inch to three inches in diameter, there is an inner heart of pale pink or magenta color.

Dr. Magruder is sending seed stock to Dr. C. H. Myers of Cornell University, who will continue breeding experiments.

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MEDICINE

Victims of Polio May Suffer Same Ill Again

INFANTILE paralysis, unlike proverbial lightning, can strike twice in the same place, Dr. Simon Flexner of the Rockefeller Institute for Medical Research reported to the National Academy of Sciences. He found that monkeys that had recovered from one attack could be given the disease a second time by infection with the same strain of virus, or with a different strain. Reinfection could take place after either a mild or a severe attack, "and in convalescent animals which have been subjected to hyperimmunization."

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CLIMATOLOGY

Drought Cycle Near End; Next One Due in 1975

DROUGHT years are nearly at an end for the United States. They will not return until 1975.

Such is the forecast of Dr. Charles G. Abbot, secretary of the Smithsonian Institution, made before the meeting of the American Geophysical Union. He said:

"We seem justified in expecting a recovery from drought conditions in the Northwest within a year or two, but a severe recurrence of them following the year 1975."

This is based on the 23-year cycle in solar activities and weather on earth, long a subject of special study by Dr. Abbot. A double period, a cycle of 46 years, "appears to be particularly important in precipitation," the Smithsonian head declared. It seems to have recurred regularly, affecting tree-ring widths . . . for four centuries. Its recurrence is in nearly the same phase as the variations of level of the Great Lakes for the past century.

The 23- and 46-year cycles have also appeared in temperature departures from normal in such widely separated regions as western Europe, South Africa and Australia.

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PUBLIC HEALTH

Silent Alarm Bell Tells Of Diphtheria Conquest

AT THE Sydenham Hospital of the Baltimore City Health Department, which takes care of communicable diseases only, the largest ward is equipped with an alarm bell. When the button is pressed, the alarm rings all over the hospital, in every corridor, in the administration building, the internes' quarters, and the nurses' home.

Ten years ago that ward was filled with diphtheria patients. A nurse was in constant attendance, every minute of the day and night, watching the patients. For most of them life depended on a tube stuck through an opening from the outside of the throat to the trachea or windpipe. The thick membrane of diphtheria closed the air passages from nose and throat, and all the air the patient got came through the tube. If the tube became clogged, suffocating death followed in a few minutes. That was the emergency for which the nurse watched constantly. When it came, she rang the alarm. Doctors dropped everything else, came at a run to the diphtheria ward. Whoever got there first set to work at once inserting a new tube.

The alarm bell is silent now. Small two-bed or single wards take care of all the diphtheria patients brought to the hospital. The large ward is occupied by patients suffering from other communicable diseases. The reason: Toxin-antitoxin or toxoid given to a child long before he starts to school protects him against diphtheria. In recent years, since the discovery of this means of preventing diphtheria has led to active control work, the deathrate from this disease in Baltimore has dropped sharply. While in 1925 there were 44 diphtheria deaths in Baltimore residents, only 2 such fatalities occurred in 1935.

The figures tell the story, and so does the silent alarm bell.

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NUTRITION

Ideal Protein Food May Soon Be Made in Laboratory

A MIXTURE of essential chemicals that may be an ideal protein substitute for the nutritional needs of man or other animals may soon be made in chemists' laboratories, it appears from the report by Dr. William C. Rose, University of Illinois biochemist, to the Federation American Societies for Experimental Biology.

What Dr. Rose has done is to analyze one class of foodstuffs, proteins which are eaten as meat, eggs and cheese, and find what chemicals in them are essential. These chemicals, the building blocks of the protein molecule, are called amino acids. The ten that must be present in the diet are: lysine, tryptophane, histidine, phenylalanine, leucine, isoleucine, methionine, valine, threonine and arginine. With the exception of arginine, the absence of any of them from the diet leads to profound nutritive failure with rapid loss of weight.

The minimum quantity of each of these essential substances has also been determined. Dr. Rose reported that for every hundred parts of food there must be 0.6 parts of threonine, 0.5 parts of isoleucine, 0.7 parts of phenylalanine, 0.6 parts of methionine, 0.4 parts of histidine and 1 part of lysine.

The minimum amounts of the others will soon be determined and then scientists can formulate a mixture which will meet the needs of the body for protein food.

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IN SCIE

ASTRONAUTICS

Undergraduates Plan Rocket Study With New Society

ROCKETRY, long considered off the main path of the engineering sciences, is attracting the attention of student engineers at Yale. The recently organized Yale Rocketry Club, consisting of engineering students and devoted to the study of fundamental rocket principles, plans to carry out actual experimentation and research in this field.

Experimentation in rocketry has long passed the phase of sending up rockets for the purpose of gathering pertinent facts about the efficiency of the device. Proving stands built to hold the rocket motor securely to the ground, having delicate gauging mechanisms, furnish data on fuel flow, fuel tank and combustion chamber pressures, and jet reactions. This method the engineers of the Yale Rocket Club plan to use.

The most pressing problems for rocket research are those concerning liquid fuels, used today almost to the exclusion of old-fashioned explosive powder mixtures; and those dealing with constructional metals for the motor and the entire rocket. The Yale engineers point out that while liquid oxygen is now generally used in conjunction with either gasoline or alcohol, there are many drawbacks to this fuel mixture. They believe future development in the field of rocketry awaits the discovery of a more dependable source of power.

The liquid oxygen brings about many of the difficulties. Because of its low boiling point, large increase in volume during transformation from the liquid to gaseous state, effect upon the strength of metals at low temperatures, and its tendency to cause valves to freeze and stick, it is hard to control with certainty.

Astronautics, as this new field of science is called, is expected to yield information of an exploratory nature concerning the stratosphere. It is believed that astronautics will provide hitherto unknown facts for the meteorologist, astrophysicist, biologist, and aeronautical engineer.

Science News Letter, May 8, 1937

EE FIELDS

GENERAL SCIENCE

Scandinavia and U. S. To Exchange Scholars

EXCHANGES of scholars between the Scandinavian countries and the United States will be made in the coming months.

Dr. Robert A. Millikan, Nobel physicist of the California Institute of Technology, will lecture at the Universities of Stockholm, Upsala, Oslo, Lund and Copenhagen during May at the invitation of the American-Scandinavian Foundation.

Next academic year about 30 Swedish scientists will come to America to lecture as a part of the celebration of the 300th anniversary of the founding of the New Sweden colony on the shores of the Delaware River in 1638. Among them are Prof. The Svedberg, and Prof. Manne Siegbahn, both of the University of Upsala and both Nobelists.

Science News Letter, May 8, 1937

ENGINEERING

Toothpaste Cocktail Coming As Addition to Package Age

THIS is a package age. Often we buy things because we like their containers, whether we need the things themselves or not.

Beer cans, after a spectacular entrance into an old field, have become almost commonplace. And paper cups, glass containers for food that we are proud to use as dinner ware, motor oil in non-refillable cans, have made a place for themselves.

Now an even larger use of single-use containers is predicted. Arthur D. Little laboratories foresee what they call the "toothpaste cocktail," which will do away with losing the top off the toothpaste tube because you will use it once and throw it away. Hermetically sealed containers are soon to come into use for the dispensing of hair tonics, flavoring extracts and even alcoholic beverages in "one-dose" quantities.

It is predicted that there will be made this year some 25,000,000 single-use tubes for holding the makings of as many cups of soluble coffee. A paint manufacturer has greatly simplified his problem of providing a bright spectrum of many colors of paint. Uncolored or white paint only is sold in the familiar cans. But single-use tubes of colored pigments in oil are squeezed into the can by the user to make any color desired. The dealers reduce the cans on their shelves to a seventh of the usual inventory.

Envelopes are made not only of paper these days, but also of tin and other metals as well as transparent cellulose sheeting. The metal envelopes are used for holding materials that would leak or damage ordinary paper.

There are two motives in making smaller packages. One is convenience, which is the reason for the present American boom in small packages. The other is the fact that many people of low purchasing power must buy in small quantities even though that may be the most uneconomical way in the long run.

This finds an extreme in China. The American Trade Commissioner at Shanghai, in urging more suitable packaging of American goods, tells how an American raisin company recognized that its product must be brought into the buying range of the masses. It was content to package as few as five raisins in a stamp-sized envelope to be sold for the lowest unit of Chinese copper currency.

Science News Letter, May 8, 1937

PALEOBOTANY

"Gentle-Face" Skeleton Shown in Field Museum

NOT all extinct beasts were huge, ferocious-looking monsters. The Field Museum of Natural History now boasts the skeleton of a ten-million-years-dead animal of such harmless mien that it has been given a scientific name meaning "gentle-face"—*Hapalops*.

Hapalops's bones were found in crumbling sandstone cliffs on the coast of Argentina. The animal was a small relative of the great ground sloths that inhabited North America; he was only about four feet over all.

His forelimbs, longer than his hind legs, enabled him to climb trees and feed on leaves and fruits. At the same time, the formidable claws on his forefeet enabled him to dig for roots and bulbs.

Science News Letter, May 8, 1937

PSYCHOLOGY-PHYSIOLOGY

Hairy Chest is Not a Sign Of the Masculine He-Man

IF YOU were to describe your own idea of the real "he-man"—the extreme of masculinity, the chances are that you would mention broad, athletic shoulders, heavily bearded face, hairy chest, narrow lithe hips, deep booming voice, crude or rough personality.

The womanly woman is thought of as having high pitched voice, smooth, hairless skin on face and breast, broad curving hips, narrow sloping shoulders—a creature of refinement, delicacy and charm.

Yet despite the long tradition supporting these conceptions of manhood and womanhood, and despite the fact that most people have no doubt in their mind but that such differences are due to sex, scientific evidence has been lacking in this field.

Gradually, as they are attacked by scientific study, many so-called sex differences are melting away. It was a shock to many persons when the development of standardized intelligence tests revealed that men are not superior mentally to their womenfolk. Is it possible that hairy chest and "gorilla shoulders" will suffer a similar fate as criteria of masculinity?

Dr. Howard Gilkinson, University of Minnesota psychologist, raises the question and provides a surprising partial answer.

If sex is a biological entity—a force which man or woman can be thought of as having in greater or less degree—and if this force finds outward expression in such items as beards or pitch of voice, then you might expect the heavily-bearded man to have also a deep masculine voice and broad shoulders, points out Dr. Gilkinson. Yet examination of more than 200 college men showed these "secondary sex characteristics" to exist quite independently of each other.

And only one of the physical measures, voice pitch, was found to have any significant relation to masculinity as revealed by test or by ratings of associates. Hair abundance and hip-shoulder measurements do not correlate with the masculinity test or with voice pitch. Hip measures do correlate positively with shoulder measures showing, perhaps, that the man with the gorilla shoulders might be expected to have "feminine" hips.

Dr. Gilkinson's results raise the question, already suggested by another investigator, "Is there any such thing as sex, or only sexes?"

Science News Letter, May 8, 1937

ECOLOGY

Grass-Roots Science

Canadian Botanist Is Digging Deeply Into Problem Of Erosion and Weeds and Rooting Out the Solution

By DR. FRANK THONE

ROOTS look large to our natural consciousness nowadays. Floods, soil erosion, and the looming threat of choking storms swirling out of the West's "dust bowl" have made even city folk apostles of the plant-more-grass movement. We all want to see the myriad cords of roots holding fast the slipping soil that is riches if it stays where it belongs, ruin downstream and downwind if it does not. As a people, we are becoming rooters for roots.

Yet, paradoxically, we know very little about this subject that has become so important to us. About the tops of plants we know plenty. They are easy to get at, agreeable to see, and are the sources of most of the plant products we use. So botanical scientists of all kinds and degrees have for centuries centered their studies on the overground parts of plants, and have left roots in muddy darkness.

This neglect of roots has been a serious error. It is almost as bad in its way as it would be for a zoologist to make careful study of the lungs and other breathing apparatus of an animal and pay no attention to its digestive system. Roots do an important and indispensable share of every higher plant's life work: They get the all-necessary water, along with the all-necessary mineral nutrients from the soil, and they anchor the plant in place. Sometimes also they store food.

Important Function

It is important to know about how the roots of every important economic plant (whether food plant or weed) function as water- and mineral-gatherers if we are to understand and control their activities, whether as crops or crop pests. It is important to know how deeply and thoroughly roots take hold in the soil if we are to choose intelligently when we come to plant soil-binding vegetation to check erosion. We cannot afford any longer to be ignorant about roots.

Out on the Canadian prairies, at the University of Saskatchewan, there is a plant scientist who is actively doing something about it. He knows more about where roots actually go than any man who has ever lived, for he is the first man who has ever taken the trouble to remove all the soil from a whole root system, grain by grain, and chart the roots, inch by inch, as he has come to them. He is a real grass-roots botanist.

His name is T. K. Pavlychenko. He is a native of Ukrainia, but he has for several years been a Canadian citizen. He is attached to the faculty of the University of Saskatchewan, at Saskatoon, in the capacity of "weed experimentalist." He did work primarily on weed problems when he first came there, but his researches have branched out since, to include range, forage, and grain crops as well. But Mr. Pavlychenko is a highly practical kind of botanist, and will not take time to dig up and examine the root systems of non-economic wild plants. "Too much to do at present with economic species," he says. "May get round to the wild stuff later on."

Because of Weeds

The whole thing started because of weeds. Farmers on the fertile plains of Saskatchewan were increasingly troubled with several particularly persistent and pestiferous weed species. The authorities at the experiment station of the province, located at Saskatoon, decided to attack the advancing enemy with all the weapons of science.

One of the most self-evident facts about the weed situation was that the weeds were not crowding out the useful plants in the same way that they do in the moister agricultural areas of the East. Where there is plenty of moisture in the soil, the dominant weed tactics consist in crowding down the crop plants and thrusting their leaves forward to "hog up" all the necessary sunlight.

But on the drier lands of the West, the competition does not go on above ground. The tops do not crowd each other for a place in the sun. The deadly, silent battle is fought beneath the surface of the soil. There roots compete with roots for the smaller supplies of moisture and for the dissolved mineral nutrients in the water. In the East, the winner is the plant with the lustiest top, in the West, the victor is the plant with the deepest, bushiest root system.

Among the most troublesome weeds of the Saskatchewan plains were several species of wild mustard, and even worse than these, wild oats. (Yes, there really is a wild oats plant. It looks like real oats but its grain is light and worthless. The great classical botanist Linnaeus, who evidently had a sense of humor, gave it a scientific name that means "fools' oats"—*Avena fatua.*) These weeds, in turn, can be routed by two or three species of range grass, especially one brought in from western Asia, known as crested wheat grass. These fighting grasses can beat the weeds at their own deadly game of root competition.

Thorough

To Weed Experimentalist Pavlychenko fell the task of finding out exactly how the roots of each weed and crop plant behaved, both when grown alone with plenty of space both above and under ground and when grown side by side with a competing plant.

He went about the job thoroughly. He planted seeds of each kind, both separately and within competing range of other plants. At four different times during the first growing season, and with perennial plants twice more during the following year, he took out a sample plant of each kind, lifting with each

MAN-SIZED

This block of soil, 12x30x60, has been carved out to study the root system of the sod of crested wheat grass at its top.

WASHING

Using this specially built spray nozzle, the earth is carefully cleared away from the roots with a "brush" of fine water jets. Washing the soil away from the roots starts at the bottom of the column of soil and works toward the top.

plant a solid block of soil containing its entire root system. With a "brush" of fine water-jets he removed every particle of soil, charting the position of every root as he did so. Later, in flat tanks in the laboratory, he measured every inch of every root. How laborious this job was may be guessed from the fact that some of the root systems of full-grown plants had main roots and branches summing up to two and three hundred miles! When he showed one of his "extricated" root systems before the meeting of the American Association for the Advancement of Science, and later before audiences of botanists in Washington, D. C., Toronto, and Winnipeg, his fellow-scientists regarded the specimen with something like awe.

Takes Hard Digging

To get out a root system involves a great deal of hard labor, but the procedure is so straightforward and simple that anybody can understand it. It is not much more complicated than standing an egg on end—though it takes rather longer to do.

First, Mr. Pavlychenko digs a trench clear around the plant he is going to study, leaving a block of soil big enough to hold all the roots. If it is a big clump of crested wheat grass, for example, the block is four feet square and seven or eight feet deep. One side of the trench is sloped off into a kind of steep ramp. This preliminary spade-work takes about a week, and leaves the soil block standing up like a short, thick, square pillar, with the plant's overground part standing on top of it.

The next step is to enclose the pillar in a sectional case or framework, made of stout two-inch lumber and steel rods. Once securely encased, the soil mass is loosened at the bottom and tilted slowly over on its side. That is where the widening of one side of the trench into a ramp comes into the picture.

Then block and tackle is rigged to the prostrate lifting case, and a couple of husky-backed young assistants heave away at the falls until the whole massive block (it may weigh as much as two tons) has been brought up to the surface. Here it is slid onto a platform mounted on trailer wheels, and removable sides are set up around it. Bolted tight, they form an oblong watertight tank. This is filled, and the soil mass is left to soak until it is soft through—perhaps a couple of days.

With this heavy-labor part of the job finished, the real work is ready to begin. All that earth has to be removed from around and among those infinite inter-webbed roots, and yet not the smallest branch may be broken. No trowel, not even a toothpick, could meet those exacting requirements.

A Brush of Water

The only safe working tool is water; water, in fine, brush-like streams. Mr. Pavlychenko has devised such a water-brush, a flat spray-nozzle with a valve to control the force of its fine streams. With it he can wash clear every speck of soil, and even remove the occasional stone that one finds in the fine loam of the Saskatchewan prairies.

Beginning at the bottom, working slowly toward the top, the water-brush does its work. Inch by inch it discloses the webwork of the roots, and inch by inch, as they appear, the scientist charts them on a big sheet of graph paper. At the end, he has a complete map of the whole intricate root system, spread out on his cross-ruled paper like a surveyor's map of a river system. (Except that in the river system of a plant's roots the water runs uphill!) Washing and charting a big root mass is a two-week job.

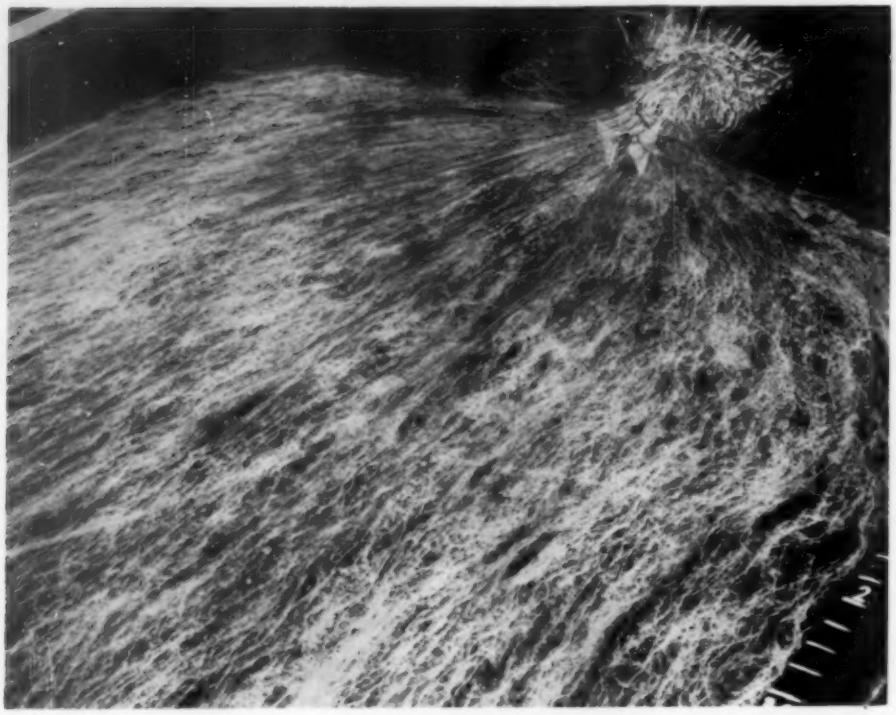
Once the root system is clear of all foreign matter, it can be rolled up and packed away in a container of preservative, to be taken out for further study when the long Saskatchewan winter comes, and not even the most enthusiastic grass-roots botanist can dig in the frozen soil. Little plants with small root systems get pickled in ordinary glass fruit jars. Big plants with huge root systems are stored in special tanks with lids. The preservative is three or four per cent formalin.

Winter Occupation

The job of measuring up a big root system may take a month of winter laboratory time. The roots are laid out in natural position in a flat, shallow tank, painted black inside to set off the white of the roots to best advantage and strongly illuminated with a battery of eight 250-watt electric lamps. Tedious as the task is, Mr. Pavlychenko and his young assistants hold themselves to it day after day. The "inchage" of some root systems reaches incredible figures—runs into millions. It becomes more convenient to reduce the measurements to miles. Thus, the root system of the crested wheat grass plant which Mr. Pavlychenko took along on his recent trip East had a thousand main roots, each with hundreds of branches, and the whole measuring up to a total of 319 miles!

To take a big root system travelling, Mr. Pavlychenko has devised an ingenious traveling tank. It is as long as the root system is wide—some forty inches. It has a tightly fitting lid, which can be sealed on. The root system is first laid out flat in its tank, with a wide sheet of oiled paper beneath it. The water is slowly drained away, letting the roots settle flat on the paper. Preservative solution is sprayed or sprinkled on. Then the paper is rolled up, roots and all, beginning at the bottom. The roll is gently lowered into the tank, which has a bulge built into its bottom, to accommodate the thick clump where roots and stems come together—the "crown," botanists call it. Thus Mr. Pavlychenko's favorite crested wheat grass specimen traveled many hundreds of miles.

Mr. Pavlychenko is enthusiastic about crested wheat grass, as a plant for the Canadian West and for the northern Great Plains of this country. It has practically all weeds licked from the first gong. It grows more roots, deeper roots, and grows them faster, than any grass he has experimented with. It holds soil. Livestock like it. It grows freely in most soils typical of the West, and its water requirements are not exacting. It is a perennial grass, but a relatively short-lived one, and since it depends on seed rather than underground runners for propagation it is not likely to become a



JUST ONE

A single crown root of a wild oat plant 80 days old. Total length of roots shown here measures more than 300 miles.

troublesome weed as its relative, quack grass, has done. In general, Mr. Pavlychenko holds, it is a most desirable type of plant immigrant.

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Science News Letter, May 8, 1937

A series of English books for Chinese readers is being prepared in China, using 850 common English words.

Drinking through straws is an idea as old as 1400 B. C., for people in Syria drank beverages that might contain dregs by inserting a copper tube with holes in it in the clay drinking jar and putting a long bent reed inside that.

Books

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MEDICINE

Much Spring Hay Fever Due to Plantain Pollen

SPRING hay fever has been thought of largely as grass hay fever, and doctors have been treating it with grass pollen extract.

Now come Drs. George I. Blumstein and Louis Tuft of the allergy clinic at Temple University, Philadelphia, with the news that 20 per cent. of the spring sneezers may attribute their trouble not to the grasses but to plantain.

By mixing some plantain pollen with the grass pollen extract, physicians and their hay fever patients may both be happier over the results, an article in *the Journal of the American Medical Association,* (May 1) states.

English or narrow-leaved plantain is a worse culprit than the common or broad-leaved plantain, because it is more abundant. As a pollen producer it ranks right along with the best of the grasses.

Plantain pollination begins about May 15 and continues until early September, but after July 1 the amounts are small.

The pollen grains on the plantain flower are hung in such a fashion that the slightest jar shakes them off and they float out into the air.

These Philadelphia physicians studied a group of 150 sufferers from all types of hay fever and found that only 7.7 per cent. of them were sensitive to plantain pollen.

When they took a group of 70 patients with spring hay fever, however, they learned that plantain was a factor in 20 per cent. of the cases.

Timothy and ragweed pollens bear no relationship to those of plantain, it was found.

Use of the dry pollen nasal test is an invaluable aid in arriving at a correct diagnosis of plantain hay fever, especially when grass hay fever exists in the same individual, these investigators learned.

Science News Letter, May 8, 1937

ANTHROPOLOGY

Expedition Seeks Mummies Threatened By Foxes

RESCUING ancient mummies from hungry foxes is one aim of a Smithsonian Institution expedition now preparing to start for Alaska.

The expedition, led by Dr. Ales Hrdlicka, noted anthropologist, will return to the Aleutian Islands, off Alaska, where last year they found some of the elusive mummy caves that were once scenes of strange Aleutian Island burials.

Salvaging the mummy bundles is of great interest, scientifically, because they shed light on physical type and cultural possessions of little-known early inhabitants of America, in the far north. Danger to the mummies is becoming acute, because fox farms are established on the islands. Famished foxes find the mummy caves, and devour the hides that wrap the mummies, gnawing and scattering the bones. Souvenir hunters have also risked their necks to land on the craggy islands to plunder the old burials.

Dr. Hrdlicka is seeking evidence particularly on migration routes taken by early people who entered America from Asia. Bering Strait was the main crossing point, but the Aleutian Islands, which swing like stepping stones across from Asiatic waters toward Alaska, may have been a secondary route, according to one theory.

Dr. Hrdlicka, assisted by volunteer college students, will explore two large ancient towns in the Aleutian Islands, never visited by white men, so far as is known. In ruins of these towns, which lie in the western part of the island chain, he may find new evidence to solve the old migration riddle.

Science News Letter, May 8, 1937

PHYSICS

Unit of Magnetism Studied; Light Becomes Tired Is Theory

American Physical Society at Washington Meeting Also Discusses Mountains and Cosmic Radiation

AN experimental method for studying one of the basic units of magnetism—called magneton—was described at the meetings of the American Physical Society in Washington, D. C., by Prof. O. Stern of the Carnegie Institute of Technology.

He suggests that whereas a beam of molecules moving horizontally will gradually fall, due to gravity, like an artillery shell fired level, it is possible with a similar beam of magnetic molecules to suspend them, in their flight, by the repulsion of a nearby magnetic field.

Prof. Stern shoots his molecular beam down a tube and beneath the tube he places, parallel, a wire carrying current. The magnetic field of this current is used to balance the fall of the molecules as they go along. He is able to determine the current which will just hold the beam in its level line and from this can calculate the force of magnetism in a single unit magneton.

"Tired" Light

A cosmic Marathon race in which "tired" light wearily struggles onward through space was described by Prof. Arthur Haas, noted theoretical physicist of Vienna who is now at the University of Notre Dame. He advanced the tired light hypothesis to explain the observed red-shift of the light from distant nebulae which has up to now been interpreted as indicating a universe blowing itself apart in expansion.

To accept the nebular red-shift as due to expansion from some central point in remote times one has to agree, said Prof. Haas, that the limit of the universe is about 500 million light years in distance. This is the distance which light, traveling at 186,000 miles a second, would speed in 500 million years. Also, added Prof. Haas, one has to agree that the matter in this expanding world of limited extent is dissolving.

The trouble with the expanding universe picture is that present telescopes like the great 100-inch diameter instrument at Mt. Wilson observatory can peer into space just about 500 million light years and thus astronomers might feel that perhaps they are already seeing to the limits of the universe. Few of them, of course, feel that present instruments have reached the limit. Therefore, the universe probably is much larger.

Prof. Haas' "tired" light suggestion to explain the red-shift which is observed in the light from distance nebulae says that as the little bundles of light energy known as quanta speed to the earth they suffer a loss of energy. In a sense they are like a man running who becomes more and more tired with the loss of energy. This "tiredness" of light quanta means they have less energy and this in turn is observed as a shifting of the light rays toward the red end of the spectrum. Thus a quantum of violet light has more energy than a quantum of blue light and a change from violet to blue color is a shift toward the red. Actually the light is not necessarily red in color as is sometimes erroneously suggested.

The virtue of Prof. Haas' suggestion is that it appears to explain the observable facts of nebular astronomy without encountering technical theoretical difficulties which have risen, in the last few years, to plague the popular expanding universe concept.

Side Thrust

A theory of mountain formation in the earth which gives quantitative agreement with the known heights of mountain ranges throughout the world was proposed by Dr. Ross Gunn, technical adviser of the U. S. Naval Research Laboratory.

The theory is an outgrowth of Dr. Gunn's earlier calculations on the side-thrust occurring along the shores of deep oceans like the Pacific. This thrust, he has already reported, is probably caused by the uneven density or lopsidedness of the earth.

This uneven formation of the earth is explained if one accepts Dr. Gunn's earlier hypothesis that the solar system originated when a huge star split into two parts; one of which became the sun and its associated planets and the other became lost by journey out into space.

The planets splitting off from the sun were hotter on one side than on the other, reasons Dr. Gunn, and this temperature difference accounts for the unequal distribution of material on the surface of the earth. Once the uneven distribution is assumed the movements of earth masses by the varying gravitational pull of the different parts can be used to explain the upthrusting that eventually has created the great mountain ranges.

Cosmic Ray Variation

Evidence that cosmic rays have a small variation in their intensity throughout the day and attain a maximum value at about eleven o'clock in the morning was reported by a Carnegie Institution of Washington scientist, Dr. S. E. Forbush, of the Department of Terrestrial Magnetism.

The daily, or diurnal, effect is very small but persistent throughout observations carried on continuously for 360 days. It amounts to less than two tenths of one per cent. of the total radiation (.17 per cent.). In general and except for minor particulars, it confirms the findings of the noted Austrian scientist Prof. V. F. Hess of Innsbruck, who was in 1936 awarded the Nobel Prize in Physics jointly with Dr. Carl Anderson. Prof. Hess for some years has been carrying on continuous studies of cosmic ray intensity and noted a daily shift in the intensity. If these results are quantitatively substantiated by observations made at other stations and are accepted by other scientists, then a satisfactory theory for the cause is required. This requirement may throw some light upon the origin of at least a small part of the radiation in cosmic rays. Further observations are being taken at Carnegie Institution's magnetic observatory at Huancayo, Peru.

Accelerating Tube

The 24-foot long accelerating tube for the giant 5,000,000 volt electric generator of Massachusetts Institute of Technology at Round Hill, Mass., has been

● RADIO

May 11, 4:15 p. m., E.S.T.
THE GRASSHOPPER PLAGUE—Dr. W. R. Walton of the U. S. Bureau of Entomology and Plant Quarantine.

May 18, 4:15 p. m. E.S.T.
THE SUPERIOR CHILD—Dr. John E. Bentley of the American University.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

completed and tested, Prof. Robert Van de Graaff and Drs. C. M. and L. C. Van Atta told the meeting.

The towering spheres that store up electric voltages in the airship hangar at Round Hill have been completed and tested for some time but the designed use of the huge equipment for atomic bombardment experiments has been delayed until the accelerating tube was finished.

The tube rests, high in the air, on a special I-beam made of bakelite-impregnated plywood. Each of its four sections contains 12 porcelain cylinders and eleven steel electrodes which gradually accelerate the particles passing down their axes from voltages supplied by the collecting spheres at each end. In use the tube is evacuated. Arrangement has been made to focus the beam of charged particles as they speed down the tube to the target so that the beam will not spread out and hit the walls of the tube with destructive effect.

Science News Letter, May 8, 1937

ASTRONOMY

Places Last Bolt in Frame Of 200-Inch Telescope

See Front Cover

THE FINAL bolt in a spiderweb of steel which will finally become the mounting for the world's largest telescope has been turned into place at the turbine plant of the Westinghouse Electric and Manufacturing Company.

Dr. Robert A. Millikan, Nobel prize winner and chairman of the executive council of California Institute of Technology at Pasadena, attended the culminating act of fitting the final part of the mounting which will have a total weight of 900,000 pounds. Thus the second stage in the fabrication of the biggest "eye" of astronomy was finished. The great glass disc for which the mirror of the huge telescope has long since been cast and is now being ground is already in the workshops of Caltech, gradually being fashioned—"figured" as astronomers say—to its proper curvature. The completed telescope: mirror, mounting, observatory building and auxiliary equipment, will cost $6,000,000 when finally put in operation in 1940. Funds were made available by the Rockefeller Foundation for the project.

The operation of the 200-inch telescope will be in charge of scientists at California Institute of Technology, and plans have been made for close cooperation with the present Mt. Wilson Observatory of the Carnegie Institution of Washington which houses the 100-inch telescope that is, today, the world's largest.

The tube of the telescope, at the bottom of which will be placed the 200-inch diameter mirror, has a total length of 60 feet—as high as a six-story building. It was made in sections, the largest of which is 22 feet wide and 12 feet high. A special annealing furnace had to be built to heat this unit after fabrication so that the internal stresses could be relieved. Although large, this piece weighs only 26,000 pounds. Heaviest unit is the central section of the horseshoe yoke of the mounting which weighs 120,000 pounds.

Oil Bearings

The weight of the entire telescope will rest, and float, on special oil bearings which will enable the instrument to be turned easily with a very small force. Previous mountings of telescopes have been on pools of mercury.

The three major units of the mountings, their size and weight, are:

1. The tube, which is 22 feet one inch in diameter and 45 feet long, with a total weight of 150,000 pounds.

2. The cage, which is 22 feet one inch in diameter and 12 feet long, weighing 26,000 pounds.

3. The horseshoe yoke and side girders, weighing 370,000 pounds, with a maximum dimension of 46 feet and a thickness of four feet.

The total weight of the mounting is 900,000 pounds, or 450 tons.

Science News Letter, May 8, 1937

The only great ape that walks erect habitually is the gibbon, which rates as the least intelligent and least man-like of the apes.

PSYCHOLOGY OF SEX
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PALEONTOLOGY

NATURE RAMBLINGS
by Frank Thone

Dinosaurs—and Others

ISN'T IT ODD, how we have fallen into the habit of regarding all extinct reptiles as dinosaurs—if only they were big ones!

Dinosaurs, to be sure, probably were the dominant forms of all reptile life that has ever inhabited the earth. They really were the bosses of the land, back in the geologic ages which scientists group together under the name of Tertiary Period, which has been called for convenience the Middle Ages of animal life. Dinosaurs were both big and varied, they included both plant-eating and flesh-eating forms, they developed such fantastic extremes as the carnivorous biped tyrannosaurs, the mountain-bodied but pin-headed brontosaurs, the freakishly-horned triceratops.

But not every reptile of those far-gone days was a dinosaur. The swimming forms that ruled the sea, the plesiosaurs and the ichthyosaurs, were not properly dinosaurs. They belonged to quite distinct groups or orders of animals, just as among modern insects flies and bees belong to quite distinct groups even though they may look somewhat alike.

Similarly, the flying reptiles that for a time held the lordship of the air were not flying dinosaurs. So far as is now known, no dinosaur ever flew. These early fliers belong to a group of their own, usually called the pterosaurs, which means merely winged reptiles. Nor were the pterosaurs the ancestors of birds. Birds did originate during the Age of Reptiles, and the first birds were astonishingly reptile-like, but they came of a different ancestral stock.

The reptiles of the Tertiary included some types that are still in existence today, notably the turtles and the crocodiles. These came in all sizes. There

were both giant turtles and little ones then, as there are giants and little ones today. There were some huge crocodilians then—but so far as that goes there still are pretty big "crocs" and alligators, where they have not been shot up too much.

The most successful of modern reptile groups, the one that includes both lizards and snakes, were less developed during the Tertiary than they have become since. In fact, the snakes at least have apparently undergone the greater part of their evolutionary development since the end of the Age of Reptiles.

Science News Letter, May 8, 1937

GEOPHYSICS

Severe Magnetic Storms Disturb Telegraph and Radio

At Times It Was Impossible To Send Any Messages As Fluctuations Occurred in Earth's Magnetic Field

FLOODS in the East were not the only evidences of storm during the recent past.

A different kind of storm, having no known direct connection with the weather, raged about the whole earth from Sunday, April 25, until Thursday, April 29, unseen, unfelt, unnoticed by most people, but making no end of trouble for telegraph and shortwave radio operators and engineers.

It was a magnetic storm, consisting of fluctuations in the earth's magnetic field. Dr. A. G. McNish, of the Carnegie Institution's laboratory of terrestrial magnetism stated that it was the most severe magnetic storm experienced for many years.

Its most immediate and important consequences, in the affairs of the everyday world, were severe interferences with types of communication depending on magnetic circuits in wire and radio waves in air, that is, the telegraph and radio businesses. The telegraph companies had "dead" periods when their instruments would not work, and the radio signals were subjected to sudden and severe fits of fading.

Transatlantic telephony showed a noticeable disturbance for a half-hour at midday on Sunday, and again from 2:25 p. m. until midnight. Severest difficulty occurred on Tuesday night, when transmission fell, for a short time, as low as four per cent. of normal.

Transatlantic shortwave radio was in similar difficulties. Between 4 p. m. and 4 a. m. daily, strong magnetic effects were noticed. At times it was impossible to send messages at all. In addition, there was a certain amount of noonday "blanketing." These difficulties, however, did not appear in the radio traffic with Central and South America except for a few brief intervals.

Another consequence, which would have been more noticed if the skies had been clearer in the East was a great increase in the display of the aurora borealis. Capt. N. H. Heck, of the U. S. Coast and Geodetic Survey, said that only a cloudy sky prevented the aurora from being seen at Washington, D. C. Such a display at this latitude is a rare event.

There appears to be a correlation between sunspot activity and magnetic storms. At present the cycle of sunspot activity is rising to a maximum, so that more of these disturbances are to be expected during the coming few years.

Magnetic storms tend to recur about every 27 days, that is, once for every rotation of the sun. There was a severe one during the last two days in March. The next magnetic storm may therefore be expected a few days before the end of May.

Sunspots Marked Coming

Two great groups of sunspots, "among the largest of the present cycle," marked the coming of the storm, Dr. F. H. Seares of the Mt. Wilson Observatory, in California, wired Science Service. The storm was marked by rapid fluctuations in the earth's magnetic fields during intervals of from twelve to twenty hours, separated by periods of quiescence lasting from eight to fourteen hours.

Science News Letter, May 8, 1937

Children who get enough vitamin D in diet when their permanent teeth are forming are less apt to have the molar teeth decay in later years, so British researchers conclude.

GENETICS

Rickets Tendency Shown To Be Hereditary

RICKETS can "run in the family," it appears from experiments reported here before the meeting of the National Academy of Sciences, by Drs. G. L. Streeter, E. A. Park and Deborah Jackson of the Carnegie Institution of Washington. The research was conducted at the Institution's department of embryology in Baltimore.

It is not the disease itself that is inherited, but the tendency to develop it if the diet is lacking in vitamin D and is defective in other respects during a critical period of early growth.

Dr. Streeter and his associates put young rats on such a rickets-producing diet as soon as they were weaned. After three weeks on the deficient diet the animals were X-rayed, to show how far rickets had developed, and were then returned to normal diet. At four months of age they were bred.

By mating susceptibles with susceptibles, after fourteen generations a strain of rats was produced which, though it resembled the non-susceptible rats in every other respect, showed a consistent, high hereditary tendency to develop rickets under dietary conditions to which the other rats showed a greater degree of resistance.

Science News Letter, May 8, 1937

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•First Glances at New Books

Science—Biography

FAMOUS AMERICAN MEN OF SCIENCE—J. G. Crowther—*Norton*, 414 p., $3.50. Biographical studies of Benjamin Franklin, Joseph Henry, Josiah Willard Gibbs, and Thomas Alva Edison, by a British scientific journalist who assays, by the way, the role of science in modern life. A few statements: Franklin was a necessary part of the chain of causes which enabled James Watt's steam engine to be introduced in industry. The Smithsonian Institution is a monument to the Oedipus complex. Gibbs died within a few yards of where he was born.

Science News Letter, May 8, 1937

Paleontology

PALAEONTOLOGY: INVERTEBRATE (7th ed.)—Henry Woods—*Cambridge* (*Macmillan*), 475 p., illus., $3.25. A new edition of a compact and useful British handbook.

Science News Letter, May 8, 1937

Chemistry

A PRACTICAL COURSE IN AGRICULTURAL CHEMISTRY FOR SENIOR STUDENTS OF AGRICULTURE, DAIRYING, HORTICULTURE AND POULTRY HUSBANDRY—Frank Knowles and J. Elphin Watkin—*Macmillan*, 188 p., $3.60. A new text that will undoubtedly be well received in agricultural colleges.

Science News Letter, May 8, 1937

Engineering

PETROLEUM PRODUCTION—Wilbur F. Cloud—*Univ. of Oklahoma*, 613 p., illus., $5. The fundamentals of production methods and petroleum technology are covered in this book designed for reference use by the student, the oil company executive or the practical production engineer.

Science News Letter, May 8, 1937

Chemistry

ORGANIC CHEMISTRY—Frank C. Whitmore—*Van Nostrand*, 1080 p., $7.50. Sources, methods of preparation, properties and reactions of thousands of known organic compounds written by the president-elect of the American Chemical Society. There are 121 pages of fine type in the index alone.

Science News Letter, May 8, 1937

Biography

MATTHEW BOULTON—H. W. Dickinson—*Cambridge University Press* (*Macmillan*), 218 p., illus., $4.50. A biography of the little known business man who had the courage to aid James Watt in those early days when steam engines were coming into being. A book to be valued by a collector of books on science in industry. A seven-page index helps in locating names, dates and places.

Science News Letter, May 8, 1937

Entomology

TERMITE CITY—Alfred E. Emerson and Eleanor Fish—*Rand McNally*, 127 p., illus., $1.50. Events in that most perfect of Soviet communes, the tropical termitarium, are here told accurately and in detail, yet with a dramatic skill in the telling that gives one the "feel" of real personality in these small and alien creatures.

Science News Letter, May 8, 1937

Biology

THE LIVING WORLD—S. H. Williams—*Macmillan*, 704 p., illus., $3.60. A textbook in general biology for colleges, by the professor of zoology in the University of Pittsburgh. Particular effort is made to maintain contact with the animals and plants as they occur in nature.

Science News Letter, May 8, 1937

Chemistry

REAGENT CHEMICALS AND STANDARDS WITH METHODS OF ASSAYING AND TESTING THEM; ALSO THE PREPARATION AND STANDARDIZATION OF VOLUMETRIC SOLUTIONS AND EXTENSIVE TABLES OF EQUIVALENTS—Joseph Rosin—*Van Nostrand*, 530 p., $6.

Science News Letter, May 8, 1937

Science

DIRECTED STUDIES IN GENERAL SCIENCE, A COMBINED WORKBOOK AND EXPERIMENT MANUAL—Donald H. Painter and George J. Skewes—*Mentzer, Bush*, 242 p., 60c. For high school use with various textbooks.

Science News Letter, May 8, 1937

Natural History

CLEVELAND'S NATURE TRAILS—Arthur B. Williams—*Cleveland Press*, 10 c; 6 c if called for at Cleveland Press office. *Obtainable only direct from Cleveland Press, Cleveland, Ohio.* Good local nature guides are common enough, but it is perhaps unique for one to be put out by a metropolitan newspaper as a venture in civic advancement. It is to be hoped that the example may be followed elsewhere.

Science News Letter, May 8, 1937

Gardening

GARDENING ON NOTHING A YEAR—Mary S. Griffith—*Hale, Cushman and Flint*, 231 p., illus., $1.75. Of the making of gardening books there is no end; but this one is different. Beginning with a couple of acres of hard-to-discipline soil (and rock) in Westchester County, and deprived by 1929 of hired help to keep it going, the author brought into action her own resources of industry, occasionally exasperated patience, gradually acquired knowledge of "dirt ecology," and (by no means least) imagination and humor. It made a success of her garden, and it makes a success of her book.

Science News Letter, May 8, 1937

Mathematics

SECOND-YEAR ALGEBRA—Howard R. Kingsbury and R. R. Wallace—*Bruce*, 428 p., $1.40. An advanced high school text, with an especially interesting chapter on the solution of simultaneous quadratic equations.

Science News Letter, May 8, 1937

Zoology

THE TRAPPER, Vol I, No. 1—Arnold S. Johnson, Editor—*American Trappers Assn., Inc., Cedar City, Utah.* Monthly per number, 15c; to members, $1 a year; to non-members, $1.50 a year; in Canada $1.25 to members, $1.75 to non-members. This new associational organ sets forth a program which stresses wildlife conservation and restoration and the improvement and use of humane traps. The Association's director of conservation is Vernon Bailey.

Science News Letter, May 8, 1937

Physics

ELECTRICITY AND MAGNETISM—A. W. Hirst—*Prentice-Hall*, 388 p., $4.50. A British text serving as an introduction to electricity and magnetism. The extensive problems are a feature of merit. A full set of them have been worked out for the student and there is a large collection for him to tackle himself.

Science News Letter, May 8, 1937

Chemistry

AN INTRODUCTION TO COLLEGE CHEMISTRY—Herman T. Briscoe—*Houghton Mifflin*, 653 p., illus., $3. Condensation of the author's well-known General Chemistry designed for shorter elementary courses. Emphasis is on understanding rather than memorizing the subject.

Science News Letter, May 8, 1937